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(54) BOBBIN-CHANGING DEVICE FOR FINISHING MACHINE SUCH AS A WINDING MACHINE AND RELATED FINISHING MACHINE

(57) A bobbin-changing device (4) for a winding machine comprising a first feed path (12) of bobbins (7) comprising a tube (6) on which a yarn (5) is wound, said first feed path (12) being shaped to feed a plurality of bobbins (7) to be unraveled, an input disc (20), arranged so as to intercept the first feed path (12), rotatable around a first axis of rotation (X1), and comprising a first side wall (22) shaped with first curvilinear sections (23) provided with at least a first recess or radial seat (24), facing said first axis of rotation (X1), configured to selectively retain and release said at least one bobbin-holder (7) plate (8), an output disc (30), rotatable about a second axis of rotation (X2), comprising a second side wall (32) shaped with second curvilinear sections (33) provided with at least one second recess or radial seat (34), with convexity facing said second axis of rotation (X2), configured to retain a bobbin (7) received from the input disc (20) and release the tube (6) of said bobbin (7) after it has been unraveled, a second release path (40) of bobbin (7) tubes (6) shaped and positioned so as to receive said tubes (6) released from the output disc (30),

- a branch (50) connecting the first feed path (12) and the second release path (40) and intercepting the input disc (20) and the output disc (30) to allow the exchange of bobbins (7) between the input disc (20) and the output disc (30).

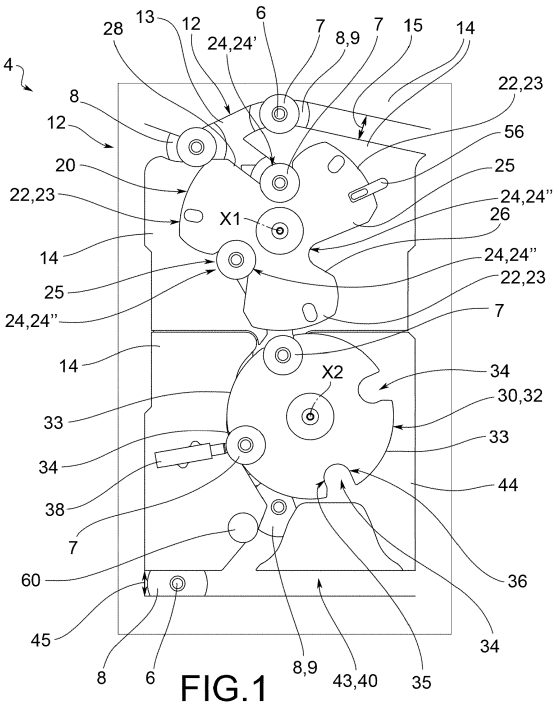

FIG.1

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Description

FIELD OF APPLICATION

[0001] This invention relates to a bobbin-changing device for a finishing machine, such as a winding machine, and a related finishing machine.

PRIOR ART

[0002] The bobbin-changing device is a device that is used in finishing machines such as winding machines and basically has the following main functions:

[0003] allocates bobbins for the subsequent unraveling stage;

[0004] unloads the empty tubes from said unraveling phase;

[0005] serves as a localized storage reservoir for the bobbins.

[0006] Physically, the bobbin-changing device is located underneath the winding units, and, in effect, one is usually provided for each winding unit (or, alternatively, one bobbin-changing device for every two winding units).

[0007] Functionally, the bobbins coming from the spinning machine, either directly or by means of an automatic loading device referred to as bulk, are prepared by a special preparer. This preparer, by means of the yarn end search function, arranges the initial end of the yarn inside the bobbin or wraps it on the top of said bobbin.

[0008] A conveyor belt 13 carries the bobbins from the previous preparation phase to the various winding units that will unravel the bobbins and, simultaneously, rewind the yarn into a larger format called a cone.

[0009] The entire bobbin handling process is controlled by the control unit of the winding machine.

[0010] By means of its software, said control unit controls the various winding phases and organizes and drives the allocation of the various bobbins according to the workloads of the individual winding units.

[0011] Thus, it will be the case that, in the vicinity of each winding unit, the bobbin is allocated to a specific winding unit, and it is at this phase that the bobbin-changing device of this unit comes into operation.

[0012] The bobbin-changing devices currently in use in the art utilize conveyor belt systems, rotating disc systems, and rotating disc systems equipped with a lever.

[0013] Such known solutions are not without their drawbacks and limitations.

[0014] For example, they do not allow good autonomy because they do not provide the possibility of storing bobbins that are ready for use; for this same reason the known systems are not very flexible and do not allow the optimized management of the available bobbins.

[0015] In effect, in known systems, bobbins are diverted to the first free winding unit and not where there is an actual feed demand.

[0016] Moreover, in known systems, it is not possible to easily and quickly handle bobbins equipped with support plates having different dimensions.

[0017] Lastly, in some known bobbin-changing devices, the bobbin changes are not very precise and may be prone to jamming insofar as they entail the ejection of an empty tube caused by the incoming bobbin pushing the tube preceding it toward the exit.

SUMMARY OF THE INVENTION

[0018] Thus, there is a need to resolve the cited drawbacks and limitations in reference to the prior art.

[0019] This need is satisfied by a bobbin-changing device according to claim 1.

DESCRIPTION OF THE DRAWINGS

[0020] Further features and advantages of this invention will become clearer from the following description of preferred non-limiting embodiments thereof, wherein:

Fig. 1 is a schematic plan view of a bobbin-changing device according to this invention;
Fig. 2-9 are schematic plan views of the bobbin-changing device of Fig. 1, during subsequent phases of operation, which are better described below;
Fig. 10 is a perspective view of a situation of confluence of multiple bobbin-holder plates;
Fig. 11 is a perspective view of a bobbin-holder plate;
Fig. 12 is a perspective view of a bobbin-holder plate bearing a bobbin;
Fig. 13 and 14 are plan and perspective views of plates with schematization of contact forces exchanged with plates delimiting the tube release path and with adjacent plates.

[0021] Elements or parts of elements common to the embodiments described hereinafter will be indicated with the same numerical references.

DETAILED DESCRIPTION

[0022] With reference to the aforesaid figures, an overall schematic view of a bobbin-changing device according to this invention has been indicated collectively with 4.

[0023] The bobbin-changing device 4 is inserted into a finishing machine, such as a winding machine (not shown). In particular, the winding machine in the process of changing the format of bobbins 7, produced by a generic spinning machine (not shown), to cones (with unwinding from the bobbins and rewinding onto the cones) must handle a large quantity of bobbins 7 that are wound onto fewer cones in a known manner. The handling of said bobbins 7 passes through the bobbin-changing device 4 which must feed the process of rapid rewinding into cones.

[0024] It is to be noted that yarn or thread 5 is wound onto a tube 6 to form a bobbin 7; when the yarn or thread 5 is unwound to form the cone, the tube 6 is supported

by the corresponding plate.

[0025] It should be clarified that the term "thread" or "monofilament" or "continuous thread" means a single filament or continuous strand (for example in the case of silk, artificial, or synthetic fibers), while the term "yarn" means the set of fibrils of variable length that are parallelized and joined by twisting. In the following, one or the other term will be used without distinction, it being understood that the applications of this invention are not limited to either type.

[0026] Each tube 6 is supported by a corresponding plate 8 shaped to have an enlarged base 9 connected to an upper central pin 10. The enlarged base 9, preferably circular, acts as a support and guide for the tube 6 or the bobbin 7 which rests thereon locked in position from above by said upper central pin 10. Preferably, a collar 11, also having a cylindrical geometry, is provided between the enlarged base 9 and the upper central pin 10. The collar 11 serves as a support base for the upper central pin 10 on which the tube 6 engages.

[0027] It should be noted that the bobbin-changing device 4 is used to manage bobbins 7 and tubes 6; practically/functionally, the bobbin-changing device 4 interacts with the plates 8 bearing the bobbin 7 and tube 6: for this reason, the two terms will be used interchangeably through the remainder of this chapter, this distinction being implied.

[0028] The bobbin-changing device 4 comprises a first feed path 12 of bobbins 7 comprising a tube 6 on which the yarn 5 is wound.

[0029] Said first feed path 12 of bobbins 7 is shaped to feed a plurality of bobbins 7 to be unraveled.

[0030] In particular, the first feed path 12 comprises a conveyor belt 13 on which the plates 9 that support the tubes 6 rest directly.

[0031] The first feed path 12 is delimited by a series of bulkheads or sheet metal support structures 14 that delimit the path of said first feed path 12; said path has a width 15 less than the plate 9 so as to constitute an undercut that prevents the plate from being extracted from above. Furthermore, the width 15 of the path is greater than or equal to the width of the collar 11 which may then slide freely within the path, in a known manner. In other words, the collar 11 acts as a guide for the plate 8, within the path.

[0032] The bobbin-changing device 4 further comprises an input disc 20, arranged to intercept the first feed path 12, rotatable about a first axis of rotation X1, and comprising a first side wall 22 shaped with first curvilinear sections 23 provided with at least one first recess or radial seat 24, having a convexity facing said first axis of rotation X1, configured to selectively retain and release said at least one bobbin 7. In particular, the first recess or radial seat 24 is configured to selectively hold and release the plate 8 carrying the tube 6 of said at least one bobbin 7.

[0033] For example, said first curvilinear sections 23 are arcs of a circle with respect to the first axis of rotation X1.

[0034] The first curved sections 23 of the input disc 20 are configured to prevent entry of a bobbin 7, originating from the input disc 20, within said at least one first recess or radial seat 24.

[0035] According to one embodiment, the at least one first recess or radial seat 24 is delimited by a pair of converging walls 25,26. In particular, said converging walls 25, 26 converge on the side of the first axis of rotation X1.

[0036] The at least one first recess or radial seat 24 is shaped to allow the input disc 20 to accommodate the at least one bobbin 7 by dragging it during rotational motion of said input disc 20.

[0037] The input disc 20 is connected to motor means (not shown) for putting it into rotation about the first axis of rotation X1, as described more fully below.

[0038] Preferably, the input disc 20 is provided with three radial recesses or seats that are angularly equispaced from each other, i.e., mutually equispaced by 120°.

[0039] Preferably, the input disc 20 is provided with at least one plate presence sensor 28 that detects the presence or absence of a bobbin 7 at said at least one first recess or radial seat 24.

[0040] The bobbin-changing device further comprises an output disc 30, rotatable about a second axis of rotation X2, comprising a second side wall 32 shaped with second curvilinear sections 33 provided with at least one second recess or radial seat 34, having a convexity facing said second axis of rotation X2, configured to retain a bobbin 7 received from the input disc 20 and to release the tube-holder 6 plate 8 of said bobbin 7 after it has been unraveled. In particular, the second recess or radial seat 24 holds and releases the bobbin 7 by means of its tube 6.

[0041] Said second curvilinear strokes 33 are arcs of a circle with respect to the second axis of rotation X2.

[0042] The second curved sections 33 of the second disc are configured to prevent entry of a bobbin-holder 7 plate 8, coming from the first feed path 12, within said at least one second recess or radial seat 34.

[0043] According to one embodiment, the at least one second radial recess 34 is delimited by a pair of converging walls 35,36. In particular, said converging walls 35, 36 converge on the side of the second axis of rotation X2.

[0044] The at least one second radial recess 34 is shaped to allow the output disc 30 to accommodate the at least one bobbin-holder 7 plate 8 by dragging it during rotational motion of said output disc 30.

[0045] The output disc 30 is connected to motor means (not shown) for putting it into rotation about the second axis of rotation X2, as described more fully below.

[0046] Preferably, the output disc 30 is provided with four radial recesses or seats 34, angularly equispaced from each other, i.e., equispaced from each other by 90 degrees.

[0047] According to a possible embodiment, the output disc 30 is provided with a plate retaining catch 38 configured to retain a bobbin-holder 7 plate 8 housed in a second recess or radial seat 34, during an unraveling step of said bobbin 7. Said plate retaining catch 38 may

be made by means of a pneumatic piston that transitions from an extracted configuration, in which it intercepts and locks the plate 8 in position with its related bobbin 7, to a retracted configuration, in which it does not affect the plate 8 as it passes.

[0048] The output disc 30 interfaces with a second release path 40 for bobbin 7 tubes 6, shaped and positioned to receive said tubes 6 released from the output disc 30, as more fully described hereinafter.

[0049] In particular, the second release path 40 comprises a second conveyor belt 43 on which the plates 9 that support the tubes 6 rest directly.

[0050] The second release path 40 is delimited by a series of bulkheads or sheet metal support structures 44 that delimit the path of said second release path 40; said path has a width 45 less than the plate 9 so as to constitute an undercut that prevents the extraction of said plate from above. Moreover, the width 45 of the route is greater than or equal to the width of the collar 11 of the tube-holder 6 plate 8 which may then slide freely within the track, in a known manner.

[0051] A branch 50 is also provided, which connects the first feed path 12 and the second release path 40 and intercepts the input disc 20 and the output disc 30 to allow the exchange of bobbin-holder 7 plates 8 and the related bobbins 7 between the input disc 20 and the output disc 30. The branch 50 is, in turn, delimited by a series of bulkheads or sheet metal support structures delimiting the route of said branch. The route of the branch has a width 52 less than the plate 9 so as to constitute an undercut that prevents the extraction of said plate from above. Furthermore, the width 52 of the path of the branch 50 is greater than or equal to the width of the collar of the tube-holder 6 plate 8, which may therefore slide freely within the path, in a known manner.

[0052] According to one embodiment, the input disc 20 and the output disc 30 are positioned so as to have the respective first side wall 22 and second side wall 32 in mutual proximity to exchange the at least one bobbin 7 from a first recess or radial seat 24 to a second recess or radial seat 34, and so as to intercept at least partially said branch 50.

[0053] The input disc 20 and the output disc 30 may either rotate in the same direction or rotate in opposite directions about their respective axes of rotation X1 and X2. Said axes of rotation X1 and X2 are parallel to each other; moreover, they are preferably parallel to the tubes 6 of the bobbins 7.

[0054] According to an embodiment, the bobbin-changing device 4 is provided with an anti-clogging bearing 60 arranged near the confluence of the branch 50 and the second release path 40. In particular, said anti-clogging bearing 60 comprises a peg calibrated to interface with the collar 11 of the plates 8 so as to guide the movement of the plates 8 through the respective collars 11. Said anti-clogging bearing 60 rotates about a preferably vertical axis, parallel to said axes of rotation X1-X1, X2-X2.

[0055] Said anti-clogging bearing 60 is characterized in that it possesses a circular-type external profile and is able to rotate freely, i.e., such that it does not cause friction that prevents it from rotating about its axis of rotation. The calibrated peg must have an outside diameter between 0.3 and 3 times the diameter of the collar 11 with which it is to interact.

[0056] The position of said anti-clogging bearing 60 should be such as to allow the collar 11 of the plate 8, which should touch its external profile, to slide away without jamming and, in particular, it should be positioned in such a way that the projection of its profile on the underlying plate 44 protrudes, with respect to said plate 44, by a value between 0 and 1/4 of the diameter of the collar 11.

[0057] Said anti-clogging bearing 60 prevents a train of plates 8 bearing tubes 6 for unloading, arriving from the second release path 40, from interacting with the plate 8 exiting from the winding head and just released from the output disc 30.

[0058] In this situation, the contact forces (highlighted by the arrows F in Fig. 13-14) are mainly unloaded onto the guide sheet of the plate 8 exiting at an angle very close to 90°, thus generating a sufficiently stable equilibrium that tends to "jam" the plate train, not allowing, in effect, either the plate train or the plate exiting from the output disc to overcome the resistance generated by said jamming, thus dissolving the blockage generated.

[0059] The presence of a very unstable contact such as the movable contact offered by the anti-clogging bearing 60 allows instead for the equilibrium of forces that are generated to become highly unstable; in practice, the geometric configuration that would generate the blockage is unable to be maintained since the outgoing plate 8 may easily move backwards or forwards with respect to the position that would lead to maintaining the jamming, making it effectively impossible for the bobbin-holder 7 plates 8 to become blocked and thus clog.

[0060] In the known solutions, the processing and control unit that manages the device reverses the rotation of the second conveyor belt 43 of the second release path 40 at regular intervals precisely to unblock all those "jamming" situations that clog the regular unloading of the tubes 6 (an event that occurs rather frequently).

[0061] With the proposed solution which provides for the anti-clogging bearing 60, the reversal of the second conveyor belt 43 is no longer necessary, and time losses and wear related to frequent stops and reversals are avoided.

[0062] The bobbin-changing device 4 is provided with a processing and control unit (not shown), operatively connected to motor means, which control the rotation of the input disc 20 and the output disc 30.

[0063] Preferably, said processing and control unit is operatively connected to at least one angular position sensor of the input disc 20 and/or the output disc 30.

[0064] Preferably, said processing and control unit is operatively connected to the plate presence sensor 28 and/or the plate retention catch 38.

[0065] Said processing and control unit effectively oversees the entire operation of the bobbin-changing device 4 and its coordination with the first feed path 12, the branch 50, and the second release path 40. It also oversees the operation, i.e., the rotation of the input disc 20 and the output disc 30 according to the data/signals received from the corresponding plate presence sensor 28, plate retaining catch 38, and angular position sensors 56.

[0066] The operation of a bobbin-changing device according to this invention will now be described.

[0067] The bobbin-changing device 4 is able to achieve the accumulation of the bobbin-holder 7 plates 8 by holding them in the various radial recesses or seats 24, 34 formed on the input disc 20 and on the output disc 30 and releasing them when the bobbins have been completely unraveled or when it is no longer possible to complete the unraveling. All of this is accomplished through different and consecutive phases.

[0068] In particular, in the initial phase (Fig. 2), the bobbin-changing device 4 finds itself in the empty condition (absence of bobbin 7 and tube 6 holder plates 8) and with the input disc 20 in the initial position (controlled by the corresponding angular position sensor 56). At said angular position, the input disc 20, at the conveyor belt 13 of the first feed path 12, faces a first curved section 23 which, as seen, is not suitable to accommodate any tube 6. In this position, the input disc 20 does not load any bobbin-holder 7 plate 8, and a bypass is achieved by forcing the bobbin-holder 7 plate 8 carried by the conveyor belt 13 of the first feed path 12 to pass over the input disc 20 to reach the next winding unit. In this case, the plate presence sensor 28 will notify the machine processing and control unit of the absence of bobbins 7 loaded in the input disc 20.

[0069] When the processing and control unit must fill the input disc 20, it rotates said disc counterclockwise until it aligns a first recess or radial seat 24 with the arrival direction of the bobbin-holder 7 plate 8 carried by the conveyor belt 13 of the first feed path 12 (Fig. 3). In so doing, the incoming bobbin-holder 7 plate 8 fills a first recess 24 which forms a first storage position 24'. When this condition is achieved, the plate presence sensor 28 notifies the processing and control unit of the machine.

[0070] It is to be noted that when a bobbin-holder 7 plate 8 occupies this first storage position 24' and the input disc 20 is in this position (shown in Fig. 3), other possible incoming bobbin-holder 7 plates 8 that should arrive transported by the conveyor belt 13 of the first feed path 12 would hit the bobbin 7 in said first storage position 24', passing over it. A new bypass condition due to an assumed overflow situation would then occur, forcing the subsequent bobbins 7 to continue to the next winding units.

[0071] Continuing to rotate the input disc 20 counterclockwise (Fig. 4) allows a new first radial seat 24 to be aligned with the arrival direction of the bobbin 7 carried by the conveyor belt 13 of the first feed path 12. In so doing, a new incoming bobbin-holder 7 plate 8 fills a second storage position 24" ; when this condition occurs, the plate presence sensor 28 notifies the processing and control unit.

[0072] With a further rotation of the input disc (Fig. 5), the original bobbin 7 that occupied the first storage position 24' in the same input disc 20 may be transferred to the output disc 30, thus liberating this position. In this position, due to the shape given to the input disc 20, a new bobbin 7 will be allowed access to said disc. In effect, a third first seat 24'" of the input disc 20 will be aligned with the input of a new bobbin 7 dragged by the conveyor belt 13 of the first feed path 12. This condition is also verified by the plate presence sensor 28 and communicated to the processing and control unit.

[0073] By rotating the output disc (Fig. 6), the bobbin 7 is brought into the unraveling position and locked in place by the plate retaining catch 38. In this position the bobbin 7, suitably prepared by the yarn end search (inserted inside the bobbin or wound on the top of the bobbin), the yarn end is captured by a special compressed air device with which the machine is equipped (in a known manner). This is where the winding unit actually begins unraveling the bobbin 7.

[0074] During the bobbin unraveling phase (Fig. 7), the output disc 30 remains stationary, while the rotation of the input disc 20 results in the transfer of the bobbins 7 from one storage position to the next. Doing so will again free a first recess or radial seat 24 of the input disc 20, allowing the input of a new bobbin 7 (an operation always controlled by the plate presence sensor 28, which communicates it to the processing and control unit.

[0075] At the end of the unraveling phase (Fig. 8), when the bobbin 7 is completely emptied of the yarn wrapped around it, only the empty tube 6 remains. By means of the subsequent rotation of the output disc 30, the tube 6 is unloaded onto the second conveyor 43 of the second release path 40 provided for the removal of the tubes 6. At the same time, due to the arrangement of the second recesses or radial seats 34, it will be possible to accommodate a new bobbin 7 in the output disc 30, arriving from the input disc 20, and to move the previously loaded bobbin 7 into the unraveling position.

[0076] In the transitions between one of the phases described above and the subsequent phases, the bobbin-changing device 4 assumes a configuration similar to the one illustrated in Fig. 9; this is a kind of "rest position" that occurs whenever the processing and control unit does not require other specific phases. In this configuration, the input disc 20 does not allow any bobbin 7 to be loaded, forcing the bobbin in transit on the conveyor belt 13 of the first feed path 12 to continue on to a specific unit that requires a new bobbin 7.

[0077] As may be appreciated from that which is described above, this invention overcomes the drawbacks of the prior art.

[0078] In particular, this invention provides the following numerous advantages.

[0079] First, it allows for a greater autonomy, since, in

addition to the bobbin being unraveled, the system allows up to three bobbins to be stored ready for use near the unraveling, increasing the autonomy of the winding unit.

[0080] Furthermore, the system allows for greater flexibility, because the double disc allows the various functions for which the bobbin-changing device is designed to be carried out simultaneously or at different times, making better use of its distinctive features.

[0081] In addition, the bobbin-changing device of this invention allows for better optimization in bobbin management, since the bobbin is allocated to where there is an actual demand, and not simply to the first free winding unit, as is the case in the solutions of the prior art.

[0082] In addition, this invention enables bobbins with different sizes of corresponding support plates, from Φ60 to Φ82.5, to be handled, including intermediate sizes.

[0083] Moreover, the bobbin-changing device of this invention allows for more precise bobbin changes that are less prone to possible jamming than some current systems in which, for example, the ejection of an empty tube is accomplished by the incoming bobbin "pushing" the tube ahead of it toward the exit.

[0084] A person skilled in the art, in order to satisfy contingent and specific needs, may make numerous modifications and variations to the solutions described above.

[0085] The scope of protection of the invention is defined in the following claims.

Claims

1. Bobbin-changing device (4) for a winding machine comprising:

   - a first feed path (12) of plates (8) bearing bobbins (7) which comprise a tube (6) on which a yarn (5) is wound, the plates (8) comprising an enlarged base (9) supporting a collar (11) and an upper central pin (10) on which said tube (6) is engaged, said first feed path (12) being shaped to feed a plurality of plates (8) bearing bobbins (7) to be unraveled,
   - an input disc (20), arranged so as to intercept the first feed path (12), rotatable around a first axis of rotation (X1), and comprising a first side wall (22) shaped with first curvilinear sections (23) provided with at least a first recess or radial seat (24), with convexity facing said first axis of rotation (X1), configured to selectively retain and release at least one bobbin-holder (7) plate (8),
   - an output disc (30), rotatable about a second axis of rotation (X2), comprising a second side wall (32) shaped with second curvilinear sections (33) provided with at least one second recess or radial seat (34), with convexity facing said second axis of rotation (X2), configured to retain a bobbin-holder (7) plate (8) received from the input disc (20) and release the plate (8) supporting the tube (6) of said bobbin (7) after it has been unraveled,
   - a second release path (40) of the bobbin-holder (7) plates (8) shaped and positioned so as to receive said plates (8) released from the output disc (30),
   - a branch (50) connecting the first feed path (12) and the second release path (40) and intercepting the input disc (20) and the output disc (30) to allow the exchange of bobbin-holder (7) plates (8) between the input disc (20) and the output disc (30).

2. The bobbin-changing device (4) according to claim 1, wherein the input disc (20) and the output disc (30) are positioned so as to have the respective first side wall (22) and second side wall (32) in mutual proximity to exchange the at least one bobbin (7) from a first recess or radial seat (24) to a second recess or radial seat (34), and so as to intercept at least partially said branch (50).

3. The bobbin-changing device (4) according to claim 1 or 2, wherein the at least one first recess or radial seat (24) is shaped to allow the input disc (20) to house at least one bobbin-holder (7) plate (8) to drag said bobbin (7) during rotational motion of the input disc (20).

4. The bobbin-changing device (4) according to claim 1, 2 or 3, wherein the first curvilinear sections (23) of the input disc (20) are configured to prevent the entry of a bobbin-holder (7) plate (8) with related bobbin (7) coming from the first feed path (12) into said at least one first recess or radial seat (24).

5. The bobbin-changing device (4) according to any of the claims from 1 to 4, wherein the at least one first recess or radial seat (24) is bounded by a pair of converging walls (25,26) and wherein said first curvilinear sections (23) are arcs of a circle with respect to the first axis of rotation (X1).

6. The bobbin-changing device (4) according to any of the claims from 1 to 5, wherein the input disc (20) is provided with at least one plate presence sensor (28) detecting the presence or absence of a bobbin (7) at said at least one first recess or radial seat (24).

7. The bobbin-changing device (4) according to any of the claims from 1 to 6, wherein the input disc (20) is provided with three recesses or radial seats (24', 24", 24"), angularly equispaced with each other.

8. The bobbin-changing device (4) according to any of the claims from 1 to 7, wherein the at least one second radial recess (34) is shaped to allow the output

disc (30) to house the at least one bobbin (7) dragging it during the rotational motion of the output disc (30).

9. The bobbin-changing device (4) according to any of the claims from 1 to 8, wherein the second curvilinear sections (33) of the output disc (30) are configured to prevent the entrance of a bobbin-holder (7) plate (8) with related bobbin (7) coming from the input disc (20) inside said at least one second recess or radial seat (34) .

10. The bobbin-changing device (4) according to any of the claims from 1 to 9, wherein the at least one second recess or radial seat (34) of the output disc (30) is bounded by a pair of converging walls (35,36), wherein said second curvilinear sections (33) are arcs of a circle with respect to the second axis of rotation (X1).

11. The bobbin-changing device (4) according to any of the claims from 1 to 10, wherein the output disc (30) is provided with a plate retaining catch (38) configured to retain a bobbin (7) housed in a second recess or radial seat (34), during an unraveling phase of said bobbin (7).

12. The bobbin-changing device (4) according to any of the claims from 1 to 11, wherein the output disc (30) is provided with four recesses or radial seats (34) angularly equispaced with each other.

13. The bobbin-changing device (4) according to any one of the claims from 1 to 12, wherein the bobbin-changing device (4) is provided with a control unit, operatively connected to motor means, which control the rotation of the input disc (20) and the output disc (30), wherein said control unit is operatively connected to angular position sensors (56) of the input disc (20) and/or the output disc (30).

14. The bobbin-changing device (4) according to claim 13 in combination with claims 6 and 11, wherein said control unit is operatively connected to the plate presence sensor (28) and/or the plate retention catch (38).

15. The bobbin-changing device (4) according to any of the claims from 1 to 14, wherein said bobbin-changing device (4) is provided with an anti-clogging bearing (60) placed in proximity to a confluence between the branch (50) and the second release path (40), wherein said anti-clogging bearing (60) rotates about a vertical axis, parallel to said first and second axis of rotation (X1-X1, X2-X2) of the input disc (20) and the output disc (30) .

16. The bobbin-changing device (4) according to claim 15, wherein said anti-clogging bearing (60) comprises a peg calibrated to interface with the collar (11) of the plates (8) so as to guide the movement of the plates (8) by means of the respective collars (11).

17. The bobbin-changing device (4) according to claim 16, wherein the calibrated peg has an outer diameter of between 0.3 and 3 times the diameter of the collar (11) of the plate (8).

18. The bobbin-changing device (4) according to any of the claims from 15 to 17, wherein said anti-clogging bearing (60) is positioned so that the projection of its profile onto a metal sheet (44) below, at least partially delimiting a tube release path (40) protrudes, from the metal sheet (44), by a value between 0 and 1/4 of the diameter of the collar (11).

19. A finishing machine, such as a winding machine, comprising a plurality of winding units operatively connected to at least one bobbin-changing device (4) according to any of the claims from 1 to 18.

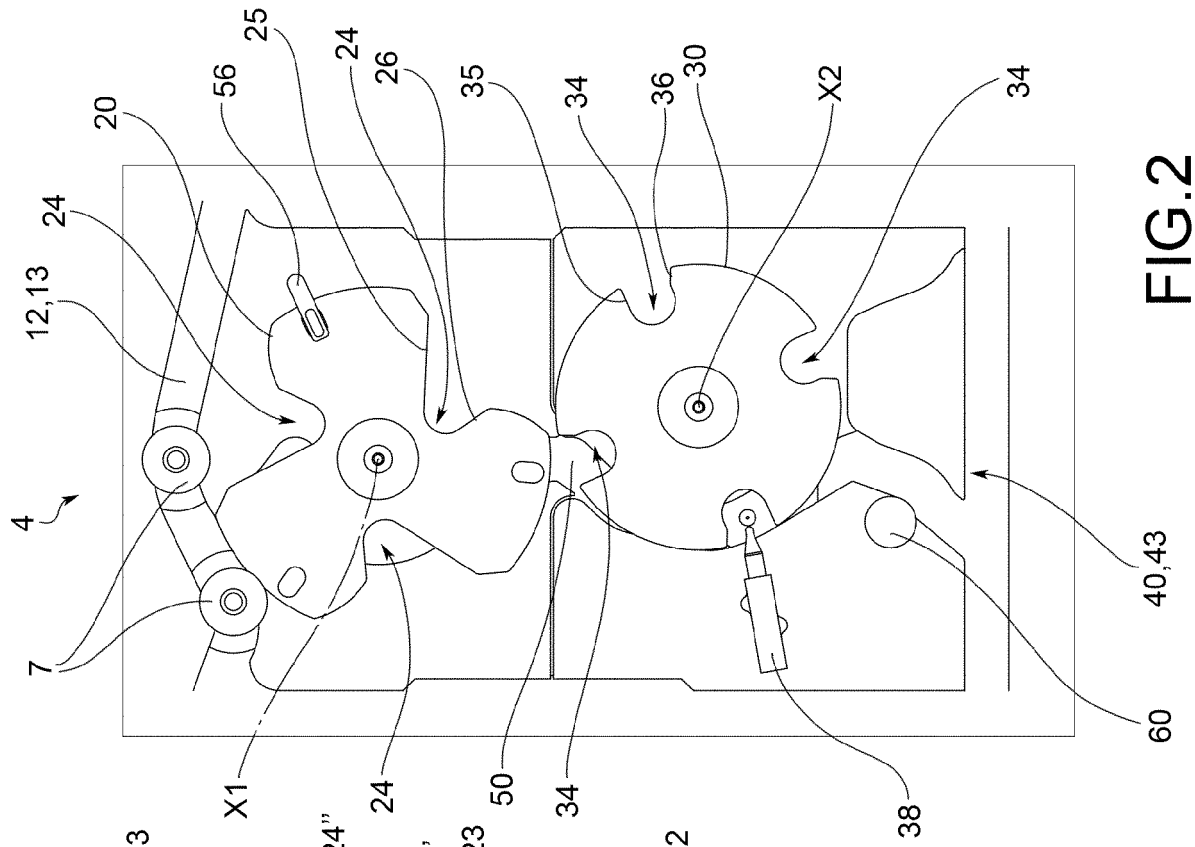
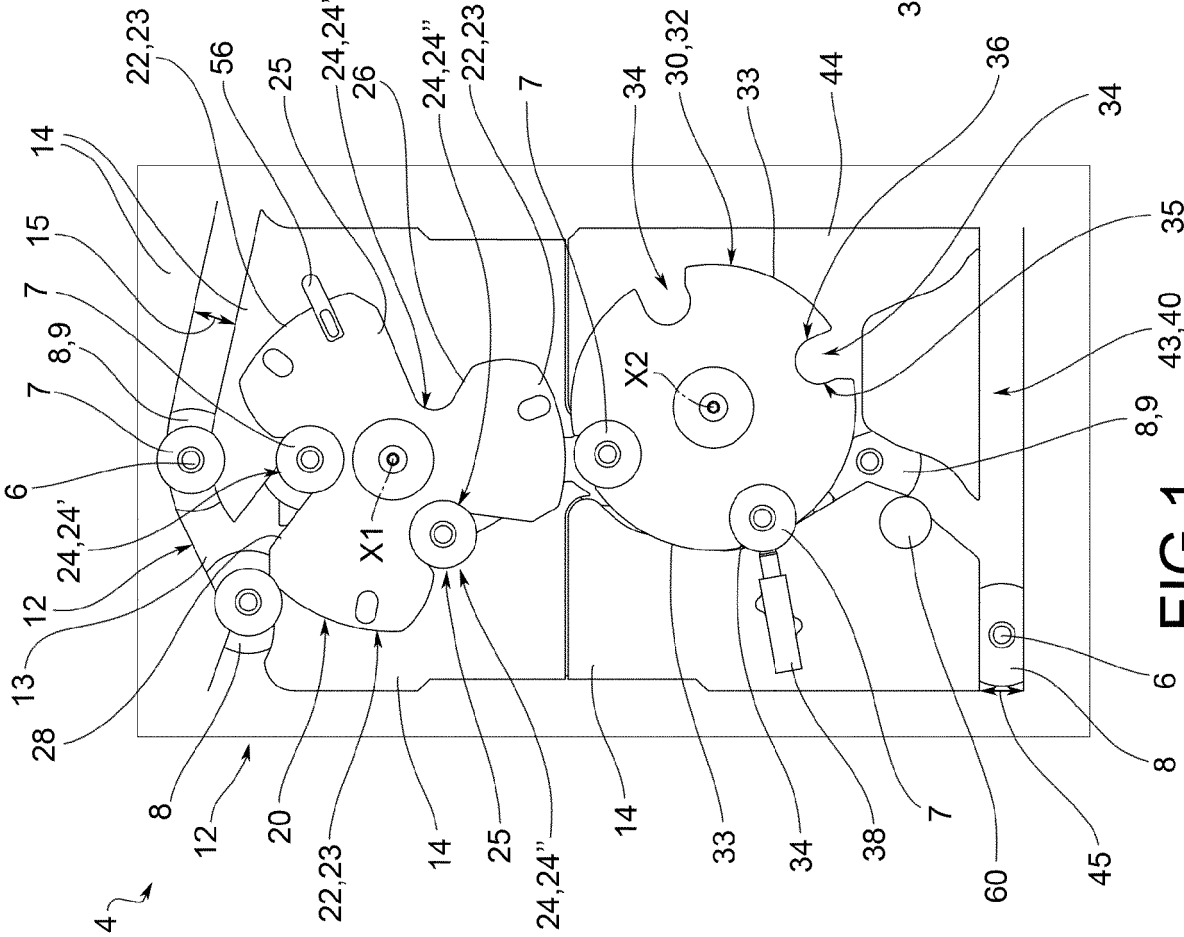

4
7
12,13
24
20
56
25
24
26
35
34
36
30
X2
34
40,43
60
38
50
34
24
X1

FIG.2


4
6
7
8,9
7
14
15
24,24'
12
13
28
8
12
20
22,23
14
25
24,24''
22,23
56
25
24,24''
26
24,24''
22,23
7
14
33
34
38
7
60
45
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43,40
8,9
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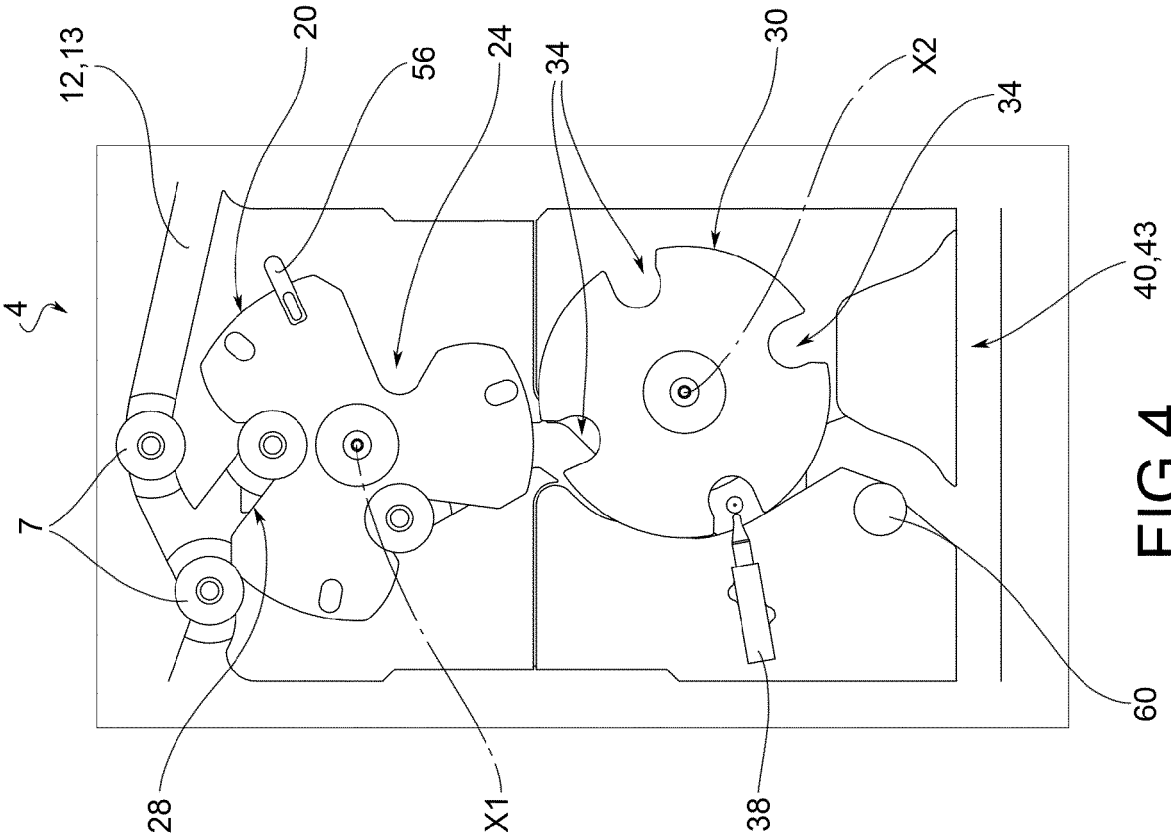
36
44
33
30,32
34
X2
X1

FIG.1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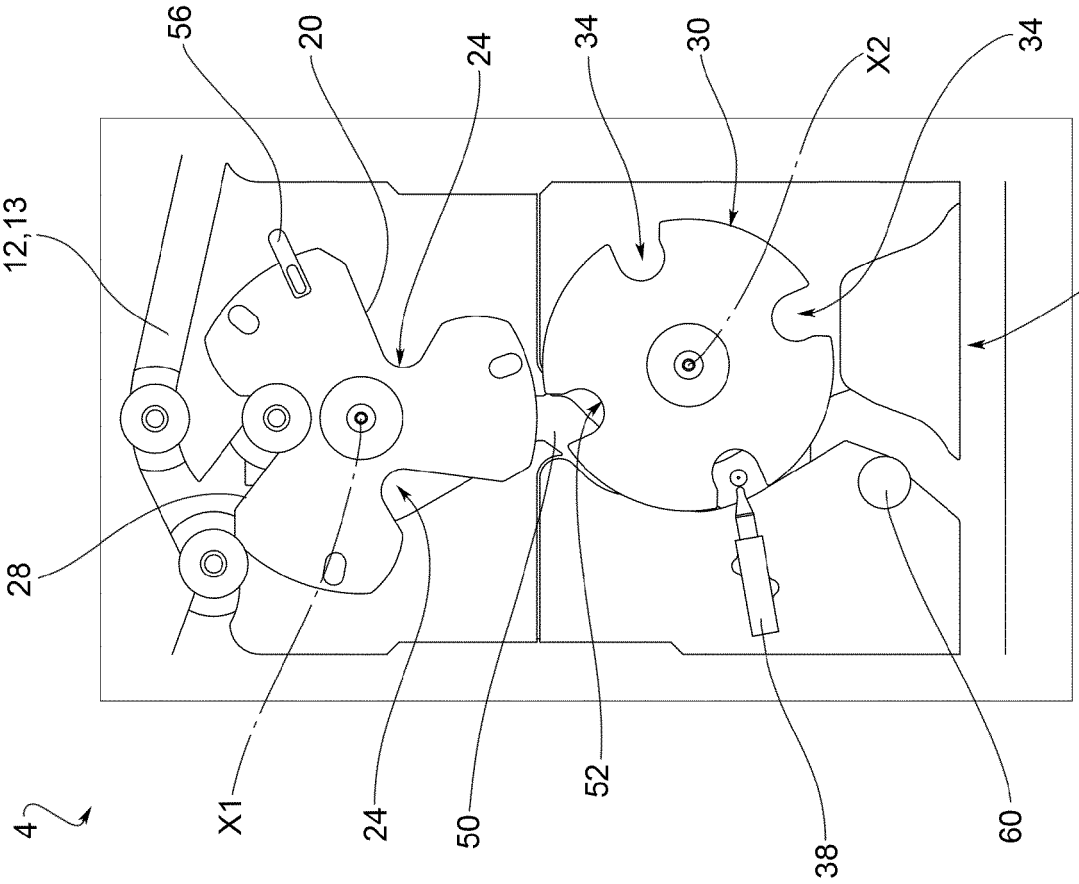
12,13
20
56
24
34
30
X2
34
40,43
7
28
X1
38
60

FIG.4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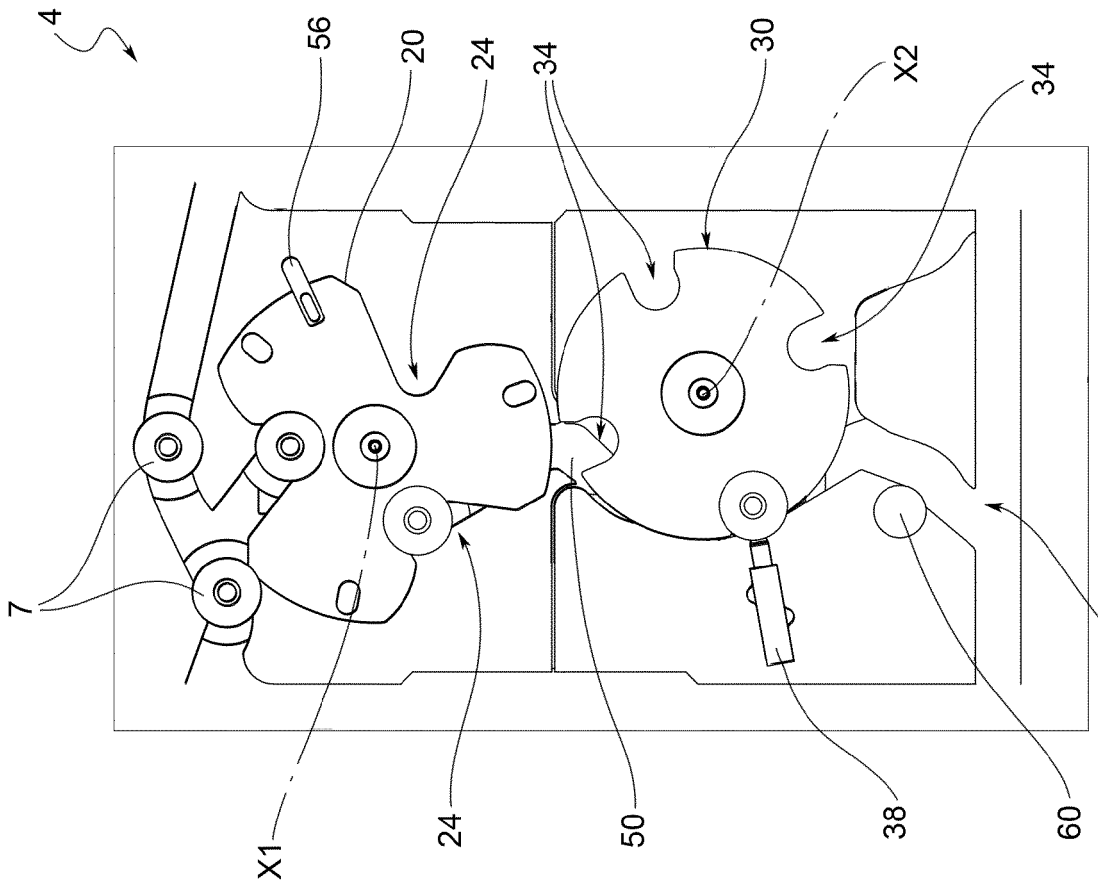
12,13
56
20
24
34
30
X2
34
40,43
28
X1
24
50
52
38
60

FIG.3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56
20
24
34
30
X2
34
7
X1
24
50
38
60
40,43

FIG.6

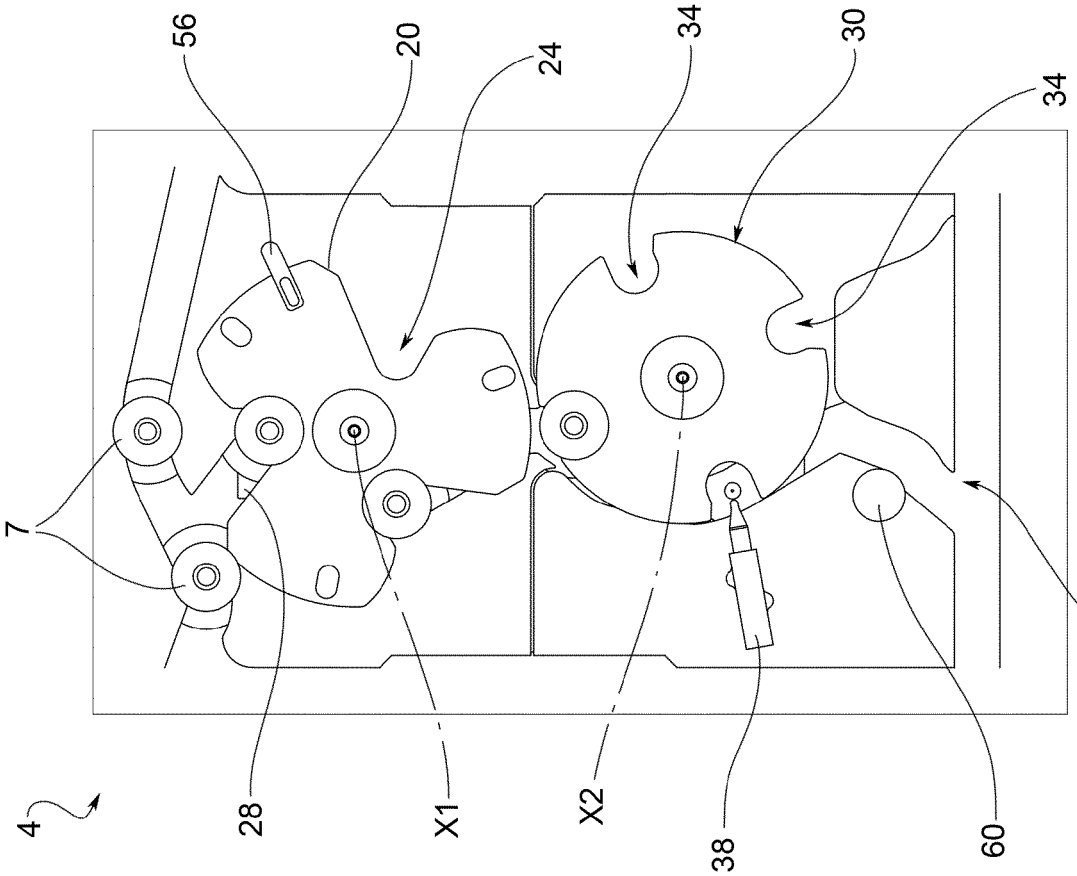
56
20
24
34
30
34
7
4
28
X1
X2
38
60
40,43

FIG.5

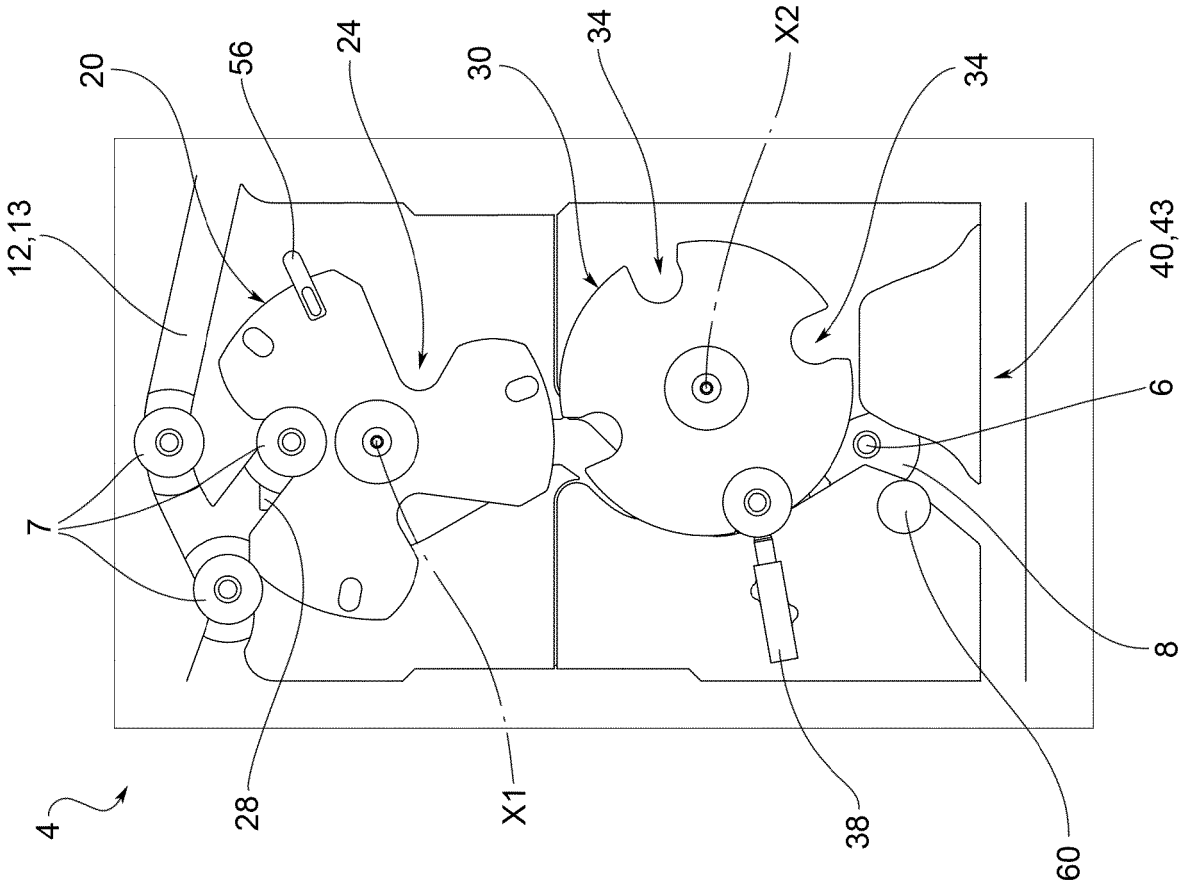
20
56
24
30
34
X2
34
12,13
40,43
6
7
8
4
28
X1
38
60

FIG.8

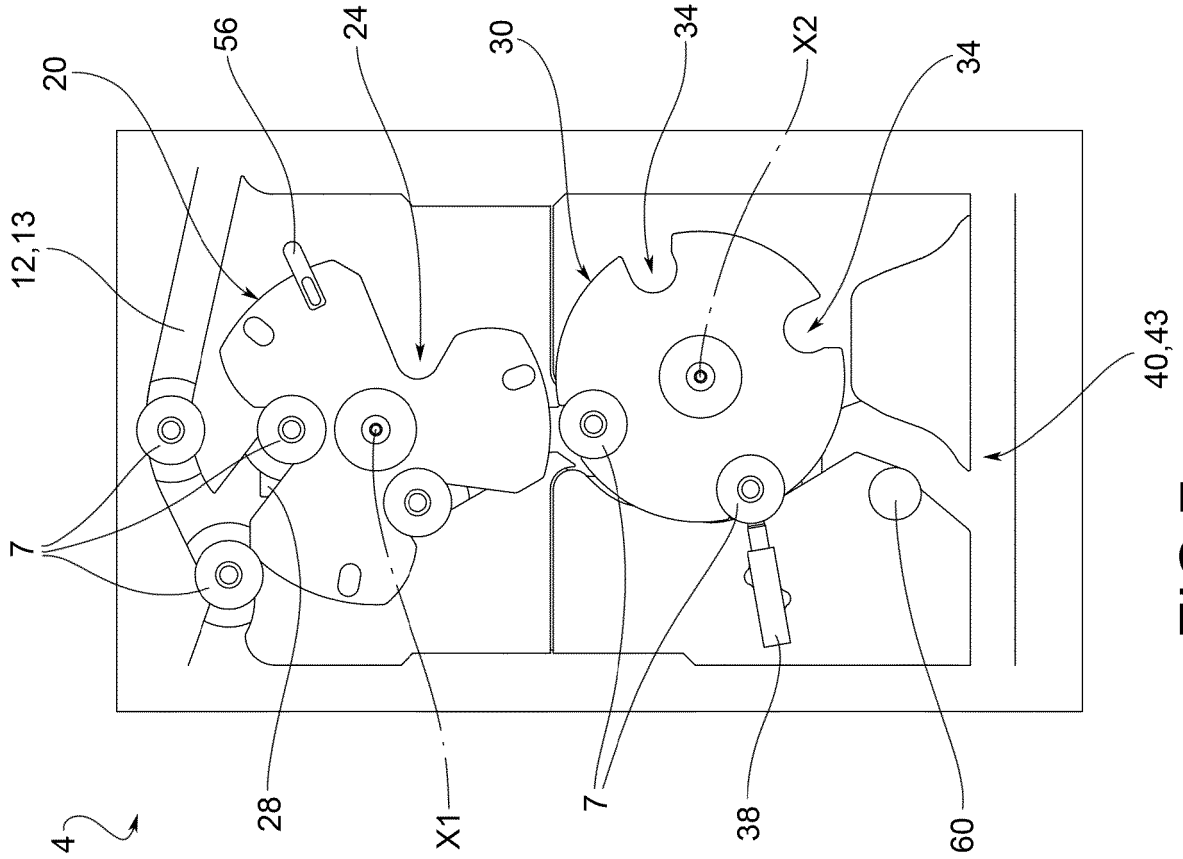
20
56
24
30
34
X2
34
12,13
40,43
7
4
28
X1
7
38
60

FIG.7

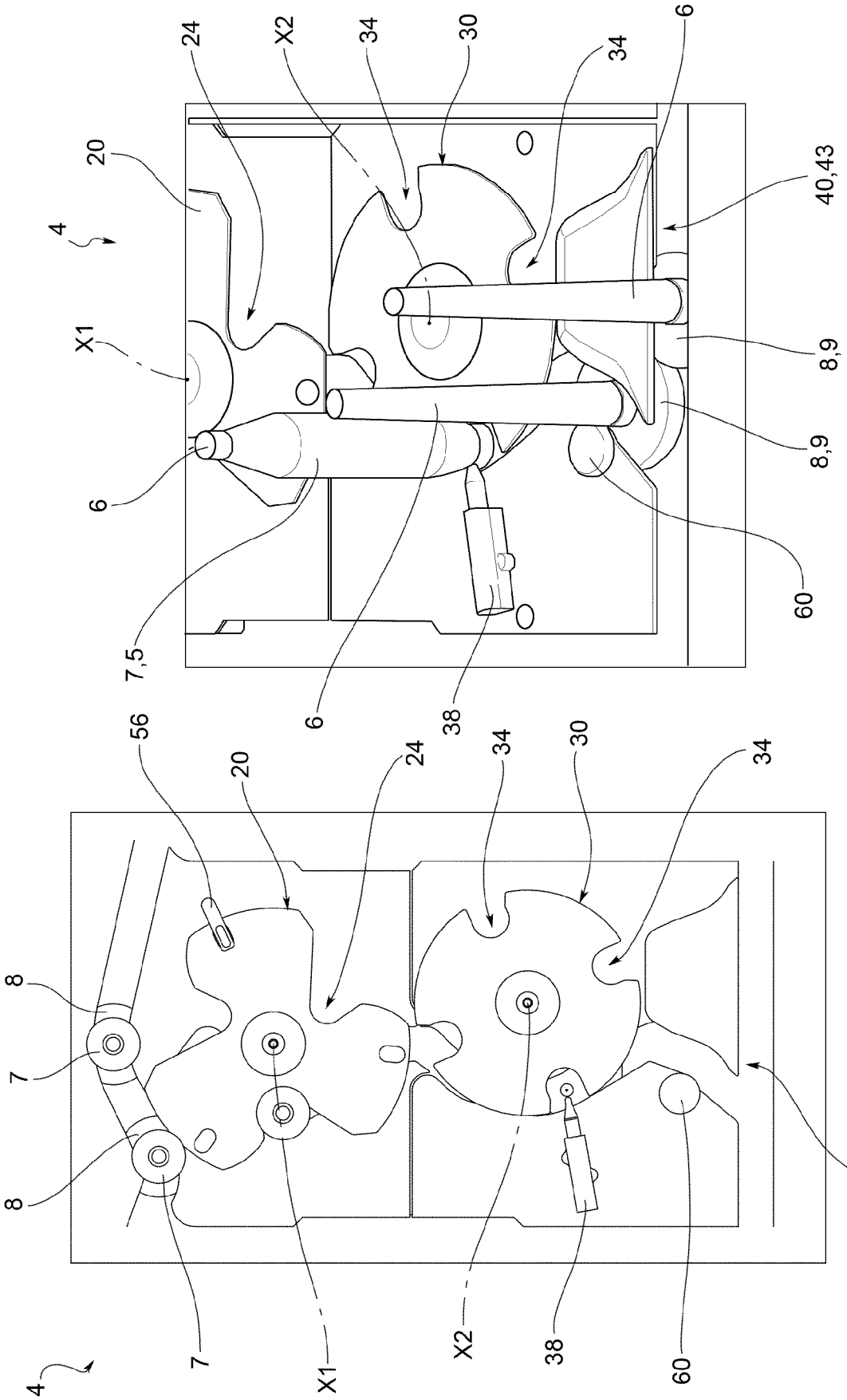
4
20
24
X2
34
30
34
6
40,43
X1
8,9
8,9
6
7,5
6
38
60
4
56
20
24
34
30
34
8
7
8
7
X1
X2
38
60
40,43

FIG.10

FIG.9

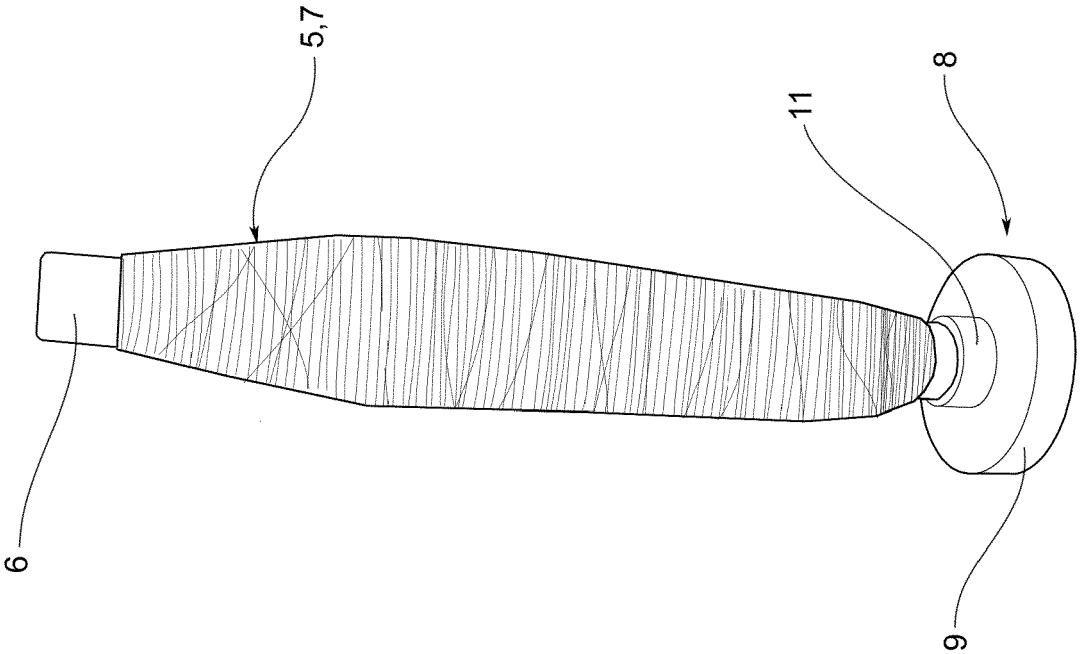

FIG.12

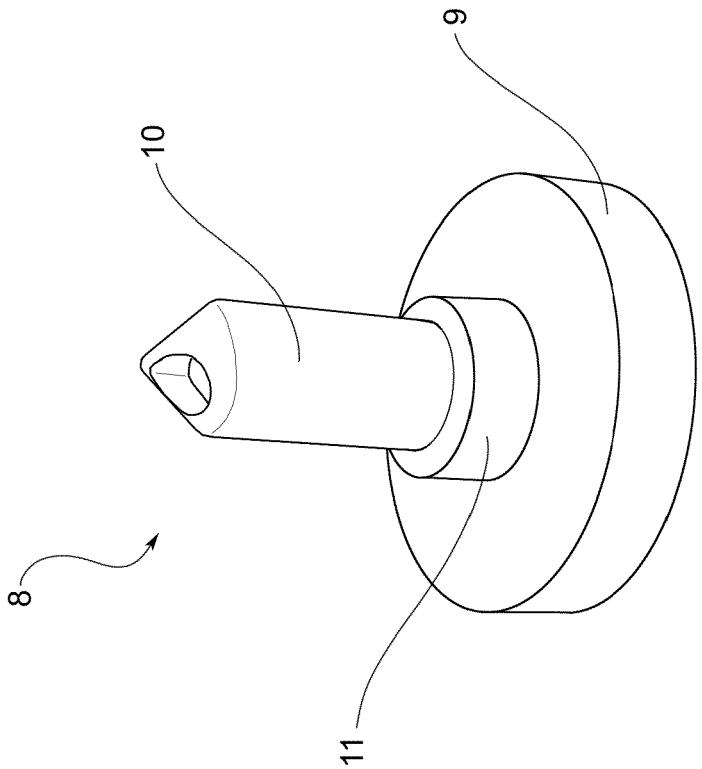

FIG.11

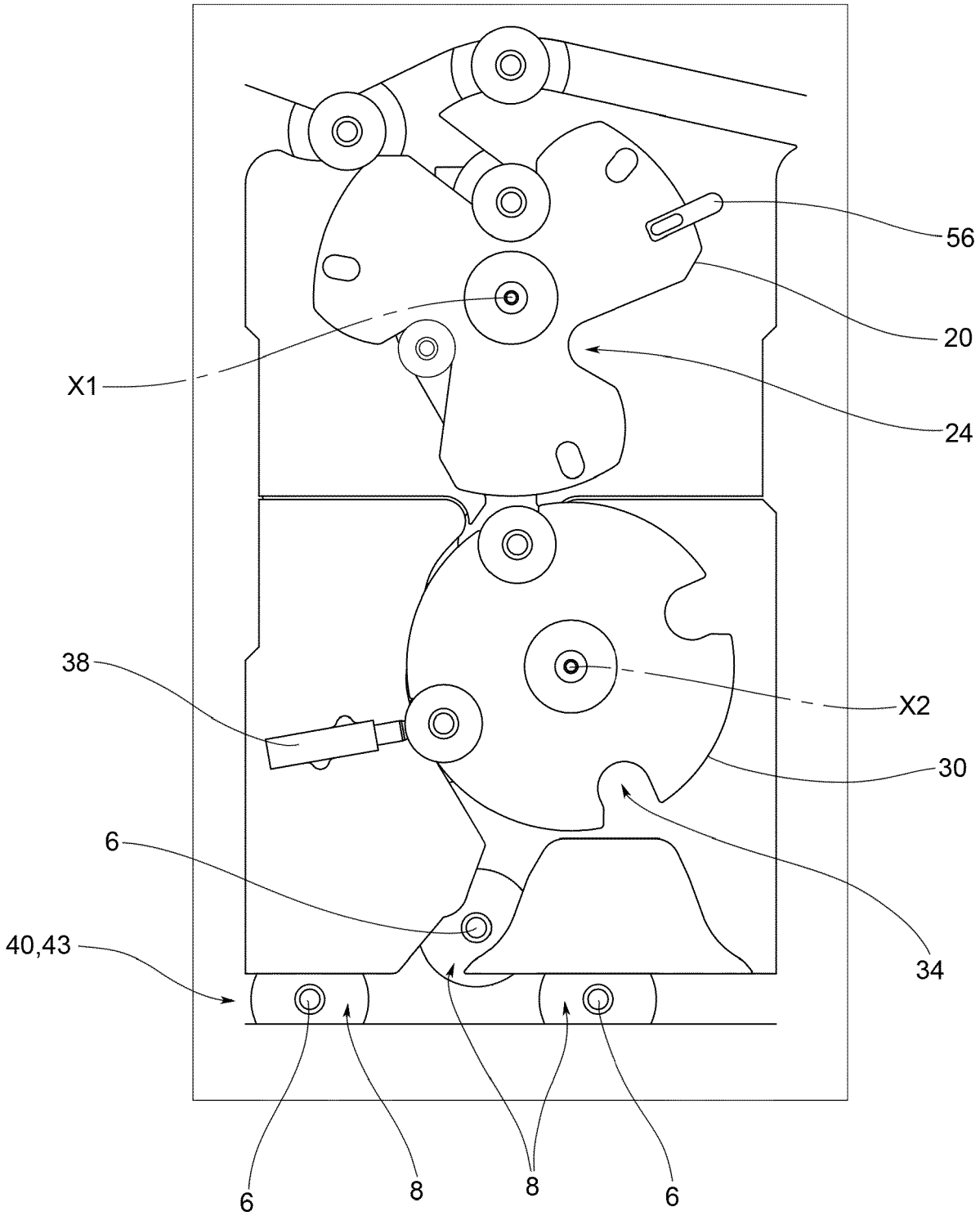

FIG.13

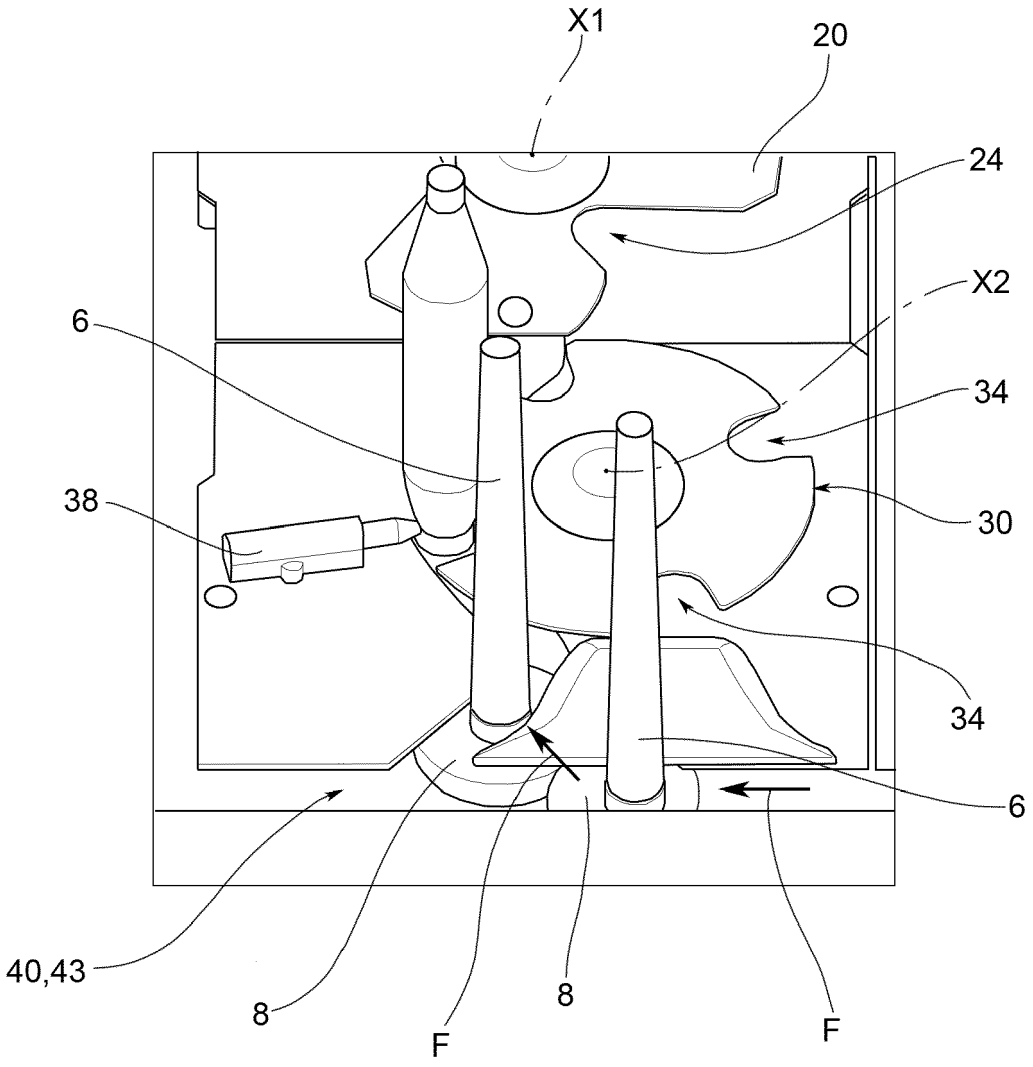

FIG.14

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EUROPEAN SEARCH REPORT

Application Number
EP 21 21 1383

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 924 273 A (BERTRAMS JOSEF [DE] ET AL) 20 July 1999 (1999-07-20)	1-10, 12-19	INV. B65H67/02
A	* column 4, lines 3-61; figures 1, 3 * * column 5, line 63 - column 6, line 67 *	11	B65H67/06
A	EP 2 119 658 A1 (OERLIKON TEXTILE GMBH & CO KG [DE]) 18 November 2009 (2009-11-18) * figures 1-3 *	1-19	
A	EP 0 905 078 A2 (MURATA MACHINERY LTD [JP]) 31 March 1999 (1999-03-31) * figures 1, 2 *	1	
A	US 4 597 540 A (KIRIAKE MASAHARU [JP]) 1 July 1986 (1986-07-01) * figures 3, 4 *	1	
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B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2 May 2022	Pussemier, Bart

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02-05-2022

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